# CHARGER FOR COMBINED BATTERY PACK

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**Inventor:** KONISHI DAISUKE
**Applicant:** JAPAN STORAGE BATTERY CO LTD
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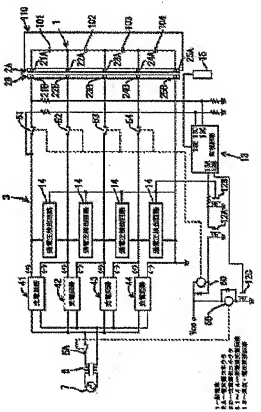
Abstract of **JP2003023736**

PROBLEM TO BE SOLVED: To simplify a protection circuit which is integrated with a combined battery pack. SOLUTION: A battery case 110 is provided with terminals 21A to 25A, connecting to each of cells 101 to 104. Charging voltage is individually applied to the cells 101 to 104 via charging terminals 21B to 25B from charging circuits 41 to 44, having charge control portions 10 of a charger 3 for charging the batteries. At this time, constant-current, constant-voltage control is exercised at the charge control portions 10 of the charging circuits 41 to 44, respectively.



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**1** **CHARGER FOR COMBINED BATTERY PACK**

**Inventor:** KONISHI DAISUKE

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(71)出願人　000004282
日本電池株式会社
京都府京都市南区吉祥院西ノ庄猪之馬場町１番地
(72)発明者　小西　大助
京都市南区吉祥院西ノ庄猪之馬場町１番地
日本電池株式会社内
(74)代理人　100096840
弁理士　後呂　和男　（外１名）

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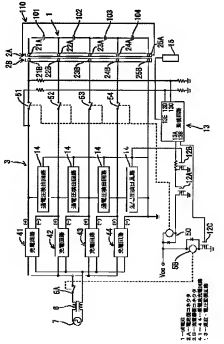
(54)【発明の名称】　組電池の充電装置

(57)【要約】
【課題】　組電池と一体化する保護回路を簡略化することができるようにする。
【解決手段】　電池ケース１１０に各単電池１０１～１０４に連なる端子２１Ａ～２５Ａを備え、充電装置３の充電制御部１０を備えた充電回路４１～４４から充電端子２１Ｂ～２５Ｂを介して単電池１０１～１０４にそれぞれ個別に充電電圧を印加し、各充電回路４１～４４の充電制御部１０でそれぞれ定電流・定電圧制御を行いながら充電する。



【特許請求の範囲】

【請求項１】　複数の単電池を直列接続してなる組電池を充電するための組電池の充電装置であって、

前記単電池の正極及び負極に連なる各端子に接続される複数対の充電端子を備え、

これらの対をなす充電端子間に前記各単電池を充電する単電池充電回路と前記対をなす充電端子間の電圧を検出して前記単電池充電回路の充電動作を制御する充電制御部とをそれぞれ備え、

前記各単電池充電回路は共通の電源に対して並列接続されることを特徴とする組電池の充電装置。

【請求項２】　前記単電池に連なる充電端子間の電圧を監視する端子電圧監視手段を設け、この端子電圧監視手段により前記充電端子間に電圧が印加されていることを条件に前記単電池充電回路の充電動作を行わせることを特徴とする請求項１記載の組電池の充電装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、組電池の充電装置に関する。

【０００２】

【従来の技術】現在、蓄電池はノートパソコンや携帯電話等の携帯電気機器の電源から無停電電源装置の電源までありゆる電気機器に幅広く利用されている。通常は、負荷の大きさに応じて単電池を複数直列接続した組電池として取り扱われている。このような組電池の充電方法として、従来は、組電池の両端電極に電圧を印加することによって充電を行うことが一般的である。しかし、単に組電池の両端電極を通じて充電を行ったのでは単電池の間で容量や内部インピーダンスのばらつきによる充電電圧の差が現れ、一部の単電池が過充電状態となり、過充電となった単電池が劣化するおそれがある。そこで、従来は、各単電池が過充電となることを防止するための保護回路と組電池とを分離不可能に電池パック内に一体に収容し、保護回路の監視の下に組電池の充電を行うこととしている。上記保護回路には各単電池毎にそれぞれの充電電圧を監視する回路を設け、いずれかの単電池が満充電であると検出されると全ての単電池について充電を終了する機能を持たせている。この場合、満充電となった単電池と、満充電となっていない単電池とが混在することになり各単電池間で充電容量のアンバランスが生じるため、さらに、各単電池の充電容量を平準化するために、満充電の単電池を放電させたり、充電不足の単電池だけを充電したりするバランサー回路を設けることもある。

【０００３】

【発明が解決しようとする課題】しかしながら、上記構成では単電池毎に充電電圧の監視を行うため、各単電池にそれぞれ電圧検出回路を設けなくてはならず、組電池と一体化される保護回路が複雑になるという問題があった。また、単電池毎の電圧検出回路に加えてバランサー回路を設ける場合には、保護回路が一層複雑化する。このような保護回路は電池パック内に一体化されているから、電池パックの軽量化や小型化の妨げになり、また、電池交換時には組電池と共に廃棄されるから無駄になる。

【０００４】本発明は、上記事情に鑑みてなされたものであり、その目的は、組電池と一体化される保護回路をできるだけ簡略化することができる組電池の充電装置を提供することである。

【０００５】

【課題を解決するための手段】請求項１の発明は、複数の単電池を直列接続してなる組電池を充電するための組電池の充電装置であって、前記単電池の正極及び負極に連なる各端子に接続される複数対の充電端子を備え、これらの対をなす充電端子間に前記各単電池を充電する単電池充電回路と前記対をなす充電端子間の電圧を検出して前記単電池充電回路の充電動作を制御する充電制御部とをそれぞれ備え、前記各単電池充電回路は共通の電源に対して並列接続されるところに特徴を有する。

【０００６】請求項２の発明は、請求項１に記載のものにおいて、前記単電池に連なる各充電端子間の電圧を監視する端子電圧監視手段を設け、この端子電圧監視手段により前記充電端子間に電圧が印加されていることを条件に前記単電池充電回路の充電動作を行わせるところに特徴を有する。

【０００７】

【発明の作用及び効果】請求項１の充電装置によれば、充電制御部と単電池充電回路とは対をなす充電端子間に備えられ、各充電端子に各単電池の正極及び負極に連なる端子が接続されると、各単電池充電回路により単電池が充電可能となる。そして、各単電池充電回路は、各単電池の電圧を検出する充電制御部によって制御されるから、各単電池をそれぞれ個別に満充電になるように充電することができる。このように、組電池の各単電池は充電装置側に設けた単電池充電回路と充電制御回路とによって個別に制御されながら充電されるから、組電池側には保護回路を設けずとも済み、或いは設けるとしても極めて簡単な構成で済む。従って、組電池と保護回路とを電池パックとして一体化した場合でも、電池パックを小型・軽量化でき、また安価に製造することができる。電池パックを小型・軽量化できることは、電池パックが電子機器側に取り付けられて持ち運びされることを考慮すると、極めて合理的である。また、電池パックを安価にできることは、組電池の寿命が尽きると電池パックごと交換される事情を考慮すると、無駄が少なくなることを意味する。

【０００８】なお、各単電池の電圧を検出する回路は、従来は組電池側に設けられていたところ、本発明では充電装置側に設けられることになるから、充電装置側の製

造コストが上昇することが懸念される。しかし、そのような懸念は次の理由によって杞憂であることが判る。すなわち、組電池を構成する各単電池は、充電装置の各単電池充電回路及び各充電制御部によってそれぞれ個別に充電され、それらの各単電池充電回路は共通の電源に対して並列接続される構成である。このことは、各単電池充電回路と充電制御部とは各単電池毎に共通の回路構成にできることを意味する。従って、単電池の構成数が異なる各種の組電池のために各種の仕様の充電装置を製造する場合でも、基本回路は同一としてその組み合わせ数を異ならせることで対処することができる。このため、その基本回路を大量生産することで充電装置全体の製造コストを安価にすることができる。

【０００９】請求項２の発明によれば、各充電端子間に端子電圧監視手段が設けられている。この端子電圧監視手段によって充電端子間の電圧を計測し、電圧が印加されていない場合は、充電装置からの電圧印加を禁止し、電圧が印加されている場合は、組電池の端子が接続されていると判断して充電動作に移行する。これより、充電装置に組電池が接続されていない場合には充電動作を行わないので、充電端子が異物により短絡された状態で充電を開始したり、電圧印加状態の充電端子に不用意に手を触れて感電したりすることを防止できる。

【００１０】

【発明の実施の形態】以下、本発明の実施形態を添付図面に基づいて説明する。

＜第１実施形態＞本発明の第１実施形態に係る組電池の充電装置について図１及び図２を参照して説明する。本実施形態は、リチウムイオン電池の組電池の充電を行う充電装置に関するものである。組電池１は電池ケース１１０内に収納されており、例えば４個の単電池１０１～１０４を直列接続してなる。また、電池ケース１１０には電池側コネクタ２Ａが備えられており、電池側コネクタ２Ａは５本の端子２１Ａ～２５Ａを備える。端子２１Ａは単電池１０１の正極に接続され、端子２５Ａは単電池１０４の負極に接続されている。端子２２Ａは単電池１０１の負極と単電池１０２の正極とに接続され、端子２３Ａ、端子２４Ａも同様に図示した通りに接続されている。

【００１１】充電装置３には電池側コネクタ２Ａと結合可能な充電器側コネクタ２Ｂが備えられており、ここに、充電端子２１Ｂ～２５Ｂが設けられている。また、前記４個の単電池１０１～１０４に対応して計４個の単電池充電回路４１～４４（以下単に充電回路４１～４４という）が備えられている。この充電回路４１～４４はメインリレースイッチ５Ａとラインフィルタ６とを介して商用電源７に接続され、各充電回路４１～４４は商用電源７に対してそれぞれ並列接続された状態となっている。一方、充電回路４１の出力側においては、正極側出力（＋）が充電端子２１Ｂに連なっており、負極側出力（－）が充電回路４２の正極側出力（＋）と接続されて充電端子２２Ｂに連なり、他の充電回路の出力も同様に図示する通りの接続状態となっており、結局、単電池１０１～１０４は充電回路４１～４４の電圧が個別に印加される回路構成となっている。

【００１２】各充電回路４１～４４は図２に示すようにスイッチングレギュレータが用いられており整流器８、絶縁型降圧チョッパ９、充電制御部１０から構成されていて、全て同一の構造である。例えば、単電池１０１を充電する充電回路４１を例にとって説明すると、入力された商用電源７からの交流電力は整流器８にて整流され、次に、絶縁型降圧チョッパ９でスイッチング素子のデューティファクタを調整して降圧した後、直流出力として取り出される。その、充電制御部１０は絶縁型降圧チョッパ９の出力電圧及び出力電流を検出して単電池１０１が定電流・定電圧充電されるように絶縁型降圧チョッパ９を制御する。これは、充電初期は定電流で充電し、電池電圧が所定の電圧に達すると定電圧充電制御に切り替わる。

【００１３】充電端子２１Ｂと充電回路４１の正極出力の間にはリレースイッチ５１が直列に設けられ、同様に充電端子２２Ｂ～２４Ｂについてもリレースイッチ５２～５４が設けられている。リレースイッチ５１～５４の開閉動作はリレー５０によって行われる。リレー５０には直列にＦＥＴ１２Ａが接続されており端子電圧監視手段に相当する温度・電圧監視回路１３（以下単に監視回路１３という）の出力ポート１３ＡがＦＥＴ１２Ａのスイッチング動作を行う。各充電回路４１～４４の正負の出力間には過電圧検出回路１４が各１つ接続され、その出力はＦＥＴ１２Ｂのスイッチング動作を行う。なお、メインリレースイッチ５Ａはリレー５Ｂによって開閉され、そのリレー５ＢにはＦＥＴ１２Ｃを介して監視回路１３の出力ポート１３Ｂにより制御される。

【００１４】監視回路１３は例えばＣＰＵを備えて構成され、その入力ポート１３Ｃはリレースイッチ５１よりも充電端子２１Ｂ側に測定点を設け、充電端子２１Ｂと充電端子２５Ｂとの間に印加される電圧を計測する。この電圧が０ボルトの場合は電池側コネクタ２Ａが接続されていないと判断されるから、出力ポート１３Ａの論理出力をロウレベル（Ｌ）のままとしてリレースイッチ５１～５４を開放状態のままとする。電圧が印加されている場合は電池側コネクタ２Ａが接続されていると判断されるから、出力ポート１３Ａの論理出力をハイレベル（Ｈ）としてリレースイッチ５１～５４を閉じる。これは、充電器側コネクタ２Ｂと電池側コネクタ２Ａとの接続状態を判断し、非接続状態で充電器側コネクタ２Ｂに充電電圧が印加されることを防止するためである。

【００１５】入力ポート１３Ｄは、リレースイッチ５１よりも充電回路４１の出力側に測定点を設け、充電端子２１Ｂと充電端子２５Ｂに印加される電圧を計測する。

リレースイッチ５１～５４が閉じられた状態となると、入力ポート１３Ｄに組電池１の電圧が印加されることになる。ここでは、予め基準電圧値が設定されており、この基準電圧値と印加された電圧値を監視装置１３で比較して出力ポート１３Ｂを変化させる。基準電圧値は過放電の単電池によるインラッシュ電流のおそれが無い程度の電圧値に設定されている。印加電圧が基準電圧値よりも低い場合は、ＦＥＴ１２ＣをＯＦＦ状態のままとして、メインリレーンスイッチ５Ａを開放状態とする。印加電圧が基準電圧値よりも高い場合は、ＦＥＴ１２ＣをＯＮ状態にしてメインリレースイッチ５Ａを閉じる。

【００１６】また、入力ポート１３Ｅは例えば充電端子２１Ｂの近傍に設けた温度測定回路１５に接続され、計測された温度値が所定の温度範囲内であるかを判断する。所定の温度範囲内にある場合は、出力ポート１３Ａ，１３Ｂの出力状態を反転せず、所定の温度範囲に無い場合は、出力ポート１３Ａ，１３Ｂをロウレベル（Ｌ）にして充電不可能な状態とする。

【００１７】さて、上記構成の動作について説明する。例えば、予め充電装置３が商用電源７に接続された状態において、充電器側コネクタ２Ｂに電池側コネクタ２Ａが接続されていない場合、入力ポート１３Ｃには電圧が印加されないので、ＦＥＴ１２ＡはＯＦＦ状態であるからリレー５０には通電されず、リレースイッチ５１～５４は開放したままである。ここで、電池側コネクタ２Ａが充電器側コネクタ２Ｂに接続されると入力ポート１３Ｃに組電池１の電圧が印加されるのでＦＥＴ１２ＡがＯＮ状態となりリレー５０が励磁され、リレースイッチ５１～５４が閉じられる。

【００１８】リレースイッチ５１～５４が閉じられると入力ポート１３Ｄに組電池１の電圧が印加される。この電圧が基準電圧値以下の場合は、ＦＥＴ１２ＣをＯＦＦとしてメインリレースイッチ５Ａを開放状態のままにして充電回路４１～４４に電力供給を行わない。基準電圧値以上である時は、ＦＥＴ１２ＣをＯＮにしてメインリレースイッチ５Ａを閉じて充電を行う。なお、単電池１０１～１０４は温度によって充電特性が変化するため、入力ポート１３Ｅに入力される温度値が予め設定された温度範囲にある場合は充電を継続し、その温度範囲外となったときは、メインリレースイッチ５Ａを開放して充電を中止する。

【００１９】単電池１０１～１０４は各充電回路４１～４４によってそれぞれ個別に定電流・定電圧充電制御が行われている。充電が進行すると、各単電池１０１～１０４で容量や内部インピーダンスの違いによる充電容量のばらつきが生ずる。従って、単電池１０１～１０４は所定の電圧になったものから順次定電流充電制御から定電圧充電制御に切り替えられる。定電圧制御であるから、満充電に近づくにつれ徐々に単電池に流れ込む充電電流は減少し、満充電となると充電電流が流れなくなることによって充電が自然と終了する。例えば、最初に単電池１０１が満充電となって充電電流が流れなくなったとしても、他の単電池１０２～１０４が満充電となっていなければ、それらに対して充電回路４２～４４による充電は継続され、次に例えば単電池１０３が満充電となれば残りの単電池１０２及び単電池１０４のみが充電が継続され、最終的に全ての単電池１０１～１０４が満充電となる。

【００２０】また、例えば、充電回路４３の充電制御部１０の制御誤りによって充電中に単電池１０３が過電圧となると、過電圧を検出した過電圧検出回路１４の出力信号がハイレベル（Ｈ）に反転する。すると、ＦＥＴ１２ＡはＯＦＦとなり、リレー５０の断電に伴ってリレースイッチ５１～５４が開放されて全ての単電１０１～１０４の充電が中断される。この過電圧検出回路１４によって二重の充電電圧の監視が行われることになるので、過電圧となって組電池１全体を劣化させる危険性がより低減される。

【００２１】このように、本実施形態によれば、単電池１０１～１０４に各１個充電回路４１～４４が備えられ、各充電回路４１～４４は電力供給源である商用電源７に対してそれぞれ並列接続された状態であり、各充電回路４１～４４によって個別に単電池１０１～１０４の充電を行う。また、各充電回路４１～４４に備えた充電制御部１０によって充電電圧の制御ができるので組電池１個の保護回路を省略することができる。これより、組電池の小型・軽量化が可能で電子機器側に取り付けられて持ち運ぶ際には特に都合がよい。また、組電池交換時には組電池の交換のみで済むことから使える保護回路まで捨てなければならないという無駄を省くことができる。

【００２２】また、入力ポート１３Ｃには充電端子２１Ｂ・充電端子２５Ｂ間の印加電圧を監視しており、入力ポート１３Ｃに印加される電圧が０ボルトの時には、出力ポート１３Ａをロウレベル（Ｌ）としてリレースイッチ５１～５４を閉じるようにしている。印加電圧０ボルトとは充電器側コネクタ２Ｂと電池側コネクタ２Ａとが接続されていないことを意味しており、この場合には、充電電圧が印加されないことになる。これによって、充電器側コネクタ２Ｂが異物よって短絡された状態で充電を開始したり、人体の一部が充電端子２１Ｂ～２５Ｂに接触し、印加電圧によって感電することを防止することができる。さらに、入力ポート１３Ｄで接続された組電池１の電圧を測定し基準電圧以下であればメインリレースイッチ５Ａを開放状態とするので、組電池１の電圧が以上に低い場合に一時的に大電流が流れることを防止することができる。

【００２３】＜第２実施形態＞本発明の第２実施形態について図３を参照して説明する。本実施形態は第１実施形態の単電池の数を７個にしたもので、同一の部分には

同一符号を付して重複する説明を省略する。即ち、７個の単電池１０１～１０７に対応して７個の充電回路４１～４７、過電圧検出回路１４、リレースイッチ５１～５７を備えたもので、各単電池１０１～１０７の充電をそれぞれ独立に行うことができる。このように、充電回路、過電圧検出回路及びリレースイッチを単電池の数に合わせて備えれば保護回路を必要としない充電装置として機能させることができる。

【００２４】このように、前記第１実施形態及び本実施形態の充電装置３の構成部品である各充電回路４１～４７と過電圧検出回路１４とは、各単電池毎に共通の回路構成とすることができる。従って、単電池の構成数が異なる各種の組電池に対してそれぞれに対応した充電装置を製造する場合においては、これら前記構成部品の組み合わせの数を変更することで対応できるので、前記構成部品を大量生産することで充電装置全体としての製造コストを安価にすることができる。

【００２５】＜他の実施形態＞本発明は上記記述及び図面によって説明した実施形態に限定されるものではなく、例えば次のような実施形態も本発明の技術的範囲に含まれ、さらに、下記以外にも要旨を逸脱しない範囲内で種々変更して実施することができる。

（１）本実施形態では、単電池単電池がリチウムイオン電池の場合を示したが、これに限らず、鉛蓄電池やニッケルカドミウム二次電池等の各種の蓄電池であってもよい。

【図面の簡単な説明】

【図１】本発明の第１実施形態に係る充電装置の回路図

【図２】第１実施形態に係る単電池充電回路の回路図

【図３】第２実施形態に係る充電装置の回路図

【符号の説明】

１…組電池

２Ａ…電池側コネクタ

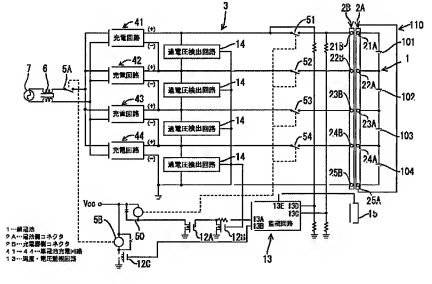
２Ｂ…充電器側コネクタ

４１～４４…単電池充電回路

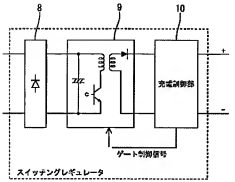
１０…充電制御部

１３…温度・電圧監視回路

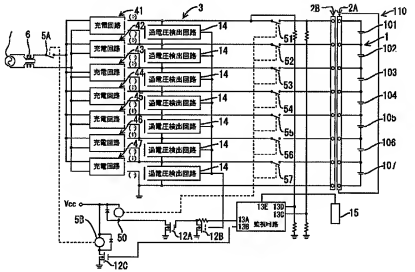
【図１】



【図2】




【図3】



* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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## CLAIMS

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[Claim(s)]
[Claim 1]It is the charging equipment of a cell group for charging a cell group which carries out the series connection of two or more cells, It has two or more pairs of charging terminals connected to each terminal which stands in a row in an anode and a negative electrode of said cell, It has a charge control part which detects voltage between charging terminals which make a cell charge circuit which charges said each cell, and said pair between charging terminals which make these pairs, and controls charging operation of said cell charge circuit, respectively, Charging equipment of a cell group, wherein multiple connection of said each cell charge circuit is carried out to a common power supply.
[Claim 2]Charging equipment of the cell group according to claim 1 making charging operation of said cell charge circuit perform on condition that a terminal voltage monitor means which supervises voltage between charging terminals which stand in a row in said cell is established and voltage is impressed between said charging terminals by this terminal voltage monitor means.

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[Translation done.]

## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the charging equipment of a cell group.
[0002]
[Description of the Prior Art]Now, the storage battery is broadly used for all electric appliances from the power supply of portable electrical apparatus, such as a notebook computer and a cellular phone, to the power supply of an uninterruptible power supply. Usually, it is dealt with as a cell group which carried out two or more series connections of the cell according to the size of load. It is common to charge by impressing voltage to the both-ends electrode of a cell group conventionally as a charging method of such a cell group. However, there is a possibility that the cell which the difference of the charge voltages by capacity or dispersion of internal impedance appeared between cells if it charged only through the both-ends electrode of a cell group, some cells were in the overcharging condition, and became a surcharge may deteriorate. Then, it is supposed that the protection circuit and cell group for preventing each cell from serving as a surcharge are accommodated in a battery pack non-detachable at one, and a cell group is conventionally charged under the surveillance of a protection circuit. The circuit which supervises each charge voltages for every cell is established in the above-mentioned protection circuit, and if it is detected that one of cells is full charges, the function which ends charge about all the cells is given. In this case, since the cell used as a full charge and the cell used as a full charge will be intermingled and the imbalance of charging capacity arises between each cell, in order to equalize the charging capacity of each cell further, The balancer circuit which makes a fully-charged cell discharge or charges only the cell of insufficient charging may be provided.
[0003]
[Problem(s) to be Solved by the Invention]However, with the above-mentioned composition, in order to supervise charge voltages for every cell, the voltage detector had to be established in each cell, respectively, and there was a problem that the protection circuit united with a cell group became complicated. In providing a balancer circuit in addition to the voltage detector for every cell, it complicates a protection circuit further. Since it is unified in the battery pack, such a protection circuit becomes the hindrance of the weight saving of a battery pack, or a miniaturization, and since it is discarded with a cell group at the time of a changing battery, it becomes useless.
[0004]In light of the above-mentioned circumstances, this invention is that the purpose provides the charging equipment of the cell group which can simplify the protection circuit united with a cell group as much as possible.
[0005]
[Means for Solving the Problem]An invention of claim 1 is the charging equipment of a cell group for charging a cell group which carries out the series connection of two or more cells, It has two or more pairs of charging terminals connected to each terminal which stands in a row in an anode and a negative electrode of said cell, Having a charge control part which detects voltage between charging terminals which make a cell charge circuit which charges said each cell, and said pair between charging terminals which make these pairs, and controls charging operation of

said cell charge circuit, respectively, said each cell charge circuit has the feature at a place by which multiple connection is carried out to a common power supply.
[0006]An invention of claim 2 establishes a terminal voltage monitor means which supervises voltage between each charging terminal which stands in a row in said cell in the thing according to claim 1, It has the feature at a place to which charging operation of said cell charge circuit is made to perform on condition that voltage is impressed between said charging terminals by this terminal voltage monitor means.
[0007]
[Function and Effect of the Invention]According to the charging equipment of claim 1, it has a charge control part and a cell charge circuit between the charging terminals which make a pair, and if the terminal which stands in a row in the anode and negative electrode of each cell is connected to each charging terminal, charge of a cell of them will be attained by each cell charge circuit. And since each cell charge circuit is controlled by the charge control part which detects the voltage of each cell, it can charge each cell so that it may become a full charge individually, respectively. Thus, since it charges being individually controlled by the cell charge circuit and charging control circuit which were established in the charging equipment side, a protection circuit is not established in the cell group side, but ** also ends, or though each cell of a cell group is formed, it can be managed with very easy composition. Therefore, even when a cell group and a protection circuit are unified as a battery pack, as for small size and a weight saving, a battery pack is made, and it can manufacture cheaply. It is very rational if it takes into consideration it being attached to a battery pack at the electronic equipment side small size and that a weight saving can be carried out, and carrying a battery pack. That a battery pack can be made cheap means that futility decreases, if the situation which will be exchanged the whole battery pack if the life of a cell group is exhausted is taken into consideration.
[0008]We are anxious about the manufacturing cost by the side of charging equipment rising, since it will be provided in the charging equipment side in this invention when the circuit which detects the voltage of each cell is conventionally established in the cell group side. However, it turns out that such concern is groundless apprehensions by the following reason. That is, each cell which constitutes a cell group is individually charged by each cell charge circuit and each charge control part of charging equipment, respectively, and each of those cell charge circuits are composition by which multiple connection is carried out to a common power supply. This means that each cell charge circuit and a charge control part are made to common circuitry for every cell. Therefore, even when manufacturing the charging equipment of various kinds of specifications for various kinds of cell groups with which the numbers of composition of a cell differ, the basic circuit can cope with it by changing the number of combination as the same. For this reason, the manufacturing cost of the whole charging equipment can be made cheap by mass-producing that basic circuit.
[0009]According to the invention of claim 2, the terminal voltage monitor means is established between each charging terminal. When the voltage between charging terminals is measured and voltage is not impressed by this terminal voltage monitor means, the voltage impressing from charging equipment is forbidden, and when voltage is impressed, it judges that the terminal of a cell group is connected and shifts to charging operation. From this, since charging operation is not performed when the cell group is not connected to charging equipment, a charging terminal can prevent starting charge, or touching the charging terminal of a voltage impressing state carelessly, and receiving an electric shock of the state where it connected too hastily with the foreign matter.
[0010]
[Embodiment of the Invention]Hereafter, the embodiment of this invention is described based on an accompanying drawing.
The charging equipment of the cell group concerning a 1st embodiment of <1st embodiment> this invention is explained with reference to drawing 1 and drawing 2. This embodiment is related with the charging equipment which charges the cell group of a lithium ion battery. The cell group 1 is stored in the cell case 110, for example, carries out the series connection of the four cells 101-104. The cell case 110 is equipped with the cell side connector 2A, and the cell side connector

2A is provided with the five terminals 21A-25A. The terminal 21A is connected to the anode of the cell 101, and the terminal 25A is connected to the negative electrode of the cell 104. It is connected to the negative electrode of the cell 101, and the anode of the cell 102, and it is connected as the terminal 22A illustrated the terminal 23A and the terminal 24A similarly.
[0011]The charging equipment 3 is equipped with battery-charger side connector 2B in which the cell side connector 2A and combination are possible, and the charging terminals 21B-25B are formed here. Corresponding to said four cells 101-104, it has a total of four cell charge circuits 41-44 (only henceforth the charge circuits 41-44). These charge circuits 41-44 are connected to the commercial power 7 via the main relay switch 5A and the line filter 6, and each charge circuits 41-44 are in the state where multiple connection was carried out to the commercial power 7, respectively. On the other hand in the output side of the charge circuit 41, the anode side output (+) stands in a row in the charging terminal 21B, The negative-electrode side output (-) is connected with the anode side output (+) of the charge circuit 42, and it stands in a row in the charging terminal 22B, and has become a connected state as the output of other charge circuits is illustrated similarly, and the cells 101-104 serve as circuitry to which the voltage of the charge circuits 41-44 is impressed individually after all.
[0012]The switching regulator is used and each charge circuits 41-44 comprise the rectifier 8, the insulated type pressure-lowering chopper 9, and the charge control part 10, as shown in drawing 2, and they are the same structures altogether. For example, if it explains taking the case of the charge circuit 41 which charges the cell 101, it is rectified by the rectifier 8, next after the alternating current power from the inputted commercial power 7 adjusts and lowers the pressure of the duty factor of a switching element by the insulated type pressure-lowering chopper 9, it will be taken out as a dc output. The charge control part 10 controls the insulated type pressure-lowering chopper 9 so that the output voltage and output current of the insulated type pressure-lowering chopper 9 are detected and the cell 101 is carried out as for constant current and constant potential charge. This will change to constant voltage charging control, if it charges by constant current and cell voltage reaches predetermined voltage the early stages of charge.
[0013]Between the anode outputs of the charging terminal 21B and the charge circuit 41, the relay switch 51 is formed in series, and the relay switches 52-54 are similarly formed about the charging terminals 22B-24B. The switching action of the relay switches 51-54 is performed by the relay 50. The output port 13A of the temperature and the voltage monitoring circuit 13 (only henceforth the supervisory circuit 13) which FET12A is connected to the relay 50 in series, and is equivalent to a terminal voltage monitor means performs switching operation of FET12A. The one overvoltage detector 14 each is connected between the outputs of the positive/negative of each charge circuits 41-44, and the output performs switching operation of FET12B. The main relay switch 5A is opened and closed by the relay 5B, and is controlled by the output port 13B of the supervisory circuit 13 by the relay 5B via FET12C.
[0014]The supervisory circuit 13 is provided with CPU and constituted, and the input port 13C establishes the point of measurement in the charging terminal 21B side rather than the relay switch 51, and measures the voltage impressed between the charging terminal 21B and the charging terminal 25B. Since it is judged that the cell side connector 2A is not connected when this voltage is 0 volt, the relay switches 51-54 are considered for the fanout of the output port 13A as as [ opened condition ] as with a low level (L). Since it is judged that the cell side connector 2A is connected when voltage is impressed, the relay switches 51-54 are closed by making fanout of the output port 13A into high level (H). This is to prevent charge voltages from judging the connected state of battery-charger side connector 2B and the cell side connector 2A, and being impressed to battery-charger side connector 2B in the state of connectionless.
[0015]The input port 13D establishes the point of measurement in the output side of the charge circuit 41 rather than the relay switch 51, and measures the voltage impressed to the charging terminal 21B and the charging terminal 25B. When it will be in the state where the relay switches 51-54 were closed, the voltage of the cell group 1 will be impressed to the input port 13D. Here, the reference voltage level is set up beforehand, the monitoring instrument 13 compares this reference voltage level and the impressed pressure value, and the output port 13B is changed.

The reference voltage level is set as the pressure value which is a grade without fear of the inrush current by the cell of overdischarge. When impressed electromotive force is lower than a reference voltage level, the main RIREN switch 5A is made into an opened condition for FET12C as with an OFF state. When impressed electromotive force is higher than a reference voltage level, FET12C is made into an ON state and the main relay switch 5A is closed.

[0016]It is judged whether the input port 13E is in a temperature requirement predetermined in the temperature value which was connected to the temperature survey circuit 15 provided near the charging terminal 21B, and was measured. When it is in a predetermined temperature requirement, the output state of the output ports 13A and 13B is not reversed, but when there is nothing to a predetermined temperature requirement, the output ports 13A and 13B are made into a low level (L), and it changes into the state which cannot be charged.

[0017]Now, operation of the above-mentioned composition is explained. For example, since voltage is not impressed to the input port 13C in the state where the charging equipment 3 was beforehand connected to the commercial power 7 when the cell side connector 2A is not connected to battery-charger side connector 2B, Since FET12A is an OFF state, it is not energized for the relay 50, but the relay switches 51-54 have been opened wide. Here, since the voltage of the cell group 1 will be impressed to the input port 13C if the cell side connector 2A is connected to battery-charger side connector 2B, FET12A will be in an ON state, the relay 50 is magnetized, and the relay switches 51-54 are closed.

[0018]If the relay switches 51-54 are closed, the voltage of the cell group 1 will be impressed to the input port 13D. When this voltage is below a reference voltage level, the main relay switch 5A is left an opened condition by setting FET12C to OFF, and an electric power supply is not performed to the charge circuits 41-44. When it is beyond a reference voltage level, it charges by turning ON FET12C and closing the main relay switch 5A. When the temperature value inputted into the input port 13E is in the temperature requirement set up beforehand, and charge is continued and it becomes the outside of the temperature requirement since a charging characteristic changes with temperature, the cells 101-104 open the main relay switch 5A wide, and stop charge.

[0019]As for the cells 101-104, constant current and constant voltage charging control are individually performed by each charge circuits 41-44, respectively. If charge advances, dispersion in capacity or the charging capacity by the difference in internal impedance will arise with each cells 101-104. Therefore, the cells 101-104 are changed from what became predetermined voltage to constant voltage charging control from constant-current-charge control one by one. The charging current which flows into a cell gradually decreases, and since it is constant voltage control, if it serves as a full charge, when charging current will not flow, it will be completed as charge is natural, as a full charge is approached. For example, though the cell 101 will serve as a full charge and charging current will not flow into the beginning, If other cells 102-104 do not serve as a full charge, the charge by the charge circuits 42-44 is continued to them, Next, for example, if the cell 103 serves as a full charge, charge will be continued only for the remaining cell 102 and the cell 104, and all the cells 101-104 will serve as a full charge eventually.

[0020]For example, if the cell 103 serves as excess voltage during charge by the control error of the charge control part 10 of the charge circuit 43, the output signal of the overvoltage detector 14 which detected excess voltage will be reversed to high level (H). Then, FET12A is set to OFF, the relay switches 51-54 are wide opened with powering off of the relay 50, and charge of all the single ** 101-104 is interrupted. Since the surveillance of double charge voltages will be performed by this overvoltage detector 14, the danger of becoming excess voltage and degrading the cell group 1 whole is reduced more.

[0021]Thus, according to this embodiment, the cells 101-104 are equipped with the one-piece each charge circuits 41-44, and each charge circuits 41-44 are in the state by which multiple connection was carried out to the commercial power 7 which is a power supply source, respectively, and charge the cells 101-104 individually by each charge circuits 41-44. Since control of charge voltages is made by the charge control part 10 with which each charge circuits 41-44 were equipped, the protection circuit by the side of the cell group 1 is omissible. The small size and the weight saving of a cell group are possible, and especially when it is attached

to the electronic equipment side and carries, it is more convenient than this. The futility that it must throw away to the protection circuit which can be used from requiring only exchange of a cell group at the time of cell group exchange can be excluded.

[0022]The input port 13C is supervising the impressed electromotive force between charging terminal 21B and the charging terminal 25B, and when the voltage impressed to the input port 13C is 0 volt, he is trying to close the relay switches 51-54 by making the output port 13A into a low level (L). It will mean that battery-charger side connector 2B and the cell side connector 2A are not connected in the impressed electromotive force of 0 volt, and charge voltages will be impressed in this case. this -- battery-charger side connector 2B -- a foreign matter -- charge can be started in the state where it connected too hastily, or some human bodies can contact the charging terminals 21B-25B, and it can prevent receiving an electric shock with impressed electromotive force. Since the voltage of the cell group 1 connected in the input port 13D is measured, and the main relay switch 5A will be made into an opened condition if it is below reference voltage, a high current can be prevented from flowing temporarily when the voltage of the cell group 1 is above low.

[0023]A 2nd embodiment of <2nd embodiment> this invention is described with reference to drawing 3. This embodiment is what made the number of the cells of a 1st embodiment seven pieces, and the explanation which gives identical codes to the same portion and overlaps is omitted. That is, it is what was provided with the seven charge circuits 41-47, the overvoltage detector 14, and the relay switches 51-57 corresponding to the seven cells 101-107, and each cells 101-107 can be charged independently, respectively. Thus, if it has a charge circuit, an overvoltage detector, and a relay switch according to the number of cells, it can be made to function as charging equipment which does not need a protection circuit.

[0024]Thus, each charge circuits 41-47 and the overvoltage detector 14 which are component parts of the charging equipment 3 of said 1st embodiment and this embodiment can be made into common circuitry for every cell. Therefore, in the case where the charging equipment corresponding to each is manufactured to various kinds of cell groups with which the numbers of composition of a cell differ, Since it can respond by changing the number of the combination of these aforementioned component parts, the manufacturing cost as the whole charging equipment can be made cheap by mass-producing said component parts.

[0025]<Other embodiment> this invention is not limited to the embodiment described with the above-mentioned description and a drawing, and further, within limits which do not deviate from a gist besides the following, it can be contained in the technical scope of this invention, and the following embodiments can also be changed variously, and can carry it out, for example.

(1) Although this embodiment showed the case where a cell cell was a lithium ion battery, they may be various kinds of storage batteries, such as not only this but a lead storage battery, and a nickel cadmium rechargeable battery.

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[Translation done.]

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TECHNICAL FIELD

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[Field of the Invention]This invention relates to the charging equipment of a cell group.

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[Translation done.]

## PRIOR ART

[Description of the Prior Art]Now, the storage battery is broadly used for all electric appliances from the power supply of portable electrical apparatus, such as a notebook computer and a cellular phone, to the power supply of an uninterruptible power supply. Usually, it is dealt with as a cell group which carried out two or more series connections of the cell according to the size of load. It is common to charge by impressing voltage to the both-ends electrode of a cell group conventionally as a charging method of such a cell group. However, there is a possibility that the cell which the difference of the charge voltages by capacity or dispersion of internal impedance appeared between cells if it charged only through the both-ends electrode of a cell group, some cells were in the overcharging condition, and became a surcharge may deteriorate. Then, it is supposed that the protection circuit and cell group for preventing each cell from serving as a surcharge are accommodated in a battery pack non-detachable at one, and a cell group is conventionally charged under the surveillance of a protection circuit. The circuit which supervises each charge voltages for every cell is established in the above-mentioned protection circuit, and if it is detected that one of cells is full charges, the function which ends charge about all the cells is given. In this case, since the cell used as a full charge and the cell used as a full charge will be intermingled and the imbalance of charging capacity arises between each cell, in order to equalize the charging capacity of each cell further, The balancer circuit which makes a fully-charged cell discharge or charges only the cell of insufficient charging may be provided.

[Translation done.]

## EFFECT OF THE INVENTION

[Function and Effect of the Invention]According to the charging equipment of claim 1, it has a charge control part and a cell charge circuit between the charging terminals which make a pair, and if the terminal which stands in a row in the anode and negative electrode of each cell is connected to each charging terminal, charge of a cell of them will be attained by each cell charge circuit. And since each cell charge circuit is controlled by the charge control part which detects the voltage of each cell, it can charge each cell so that it may become a full charge individually, respectively. Thus, since it charges being individually controlled by the cell charge circuit and charging control circuit which were established in the charging equipment side, a protection circuit is not established in the cell group side, but ** also ends, or though each cell of a cell group is formed, it can be managed with very easy composition. Therefore, even when a cell group and a protection circuit are unified as a battery pack, as for small size and a weight saving, a battery pack is made, and it can manufacture cheaply. It is very rational if it takes into consideration it being attached to a battery pack at the electronic equipment side small size and that a weight saving can be carried out, and carrying a battery pack. That a battery pack can be made cheap means that futility decreases, if the situation which will be exchanged the whole battery pack if the life of a cell group is exhausted is taken into consideration.

[0008]We are anxious about the manufacturing cost by the side of charging equipment rising, since it will be provided in the charging equipment side in this invention when the circuit which detects the voltage of each cell is conventionally established in the cell group side. However, it turns out that such concern is groundless apprehensions by the following reason. That is, each cell which constitutes a cell group is individually charged by each cell charge circuit and each charge control part of charging equipment, respectively, and each of those cell charge circuits are composition by which multiple connection is carried out to a common power supply. This means that each cell charge circuit and a charge control part are made to common circuitry for every cell. Therefore, even when manufacturing the charging equipment of various kinds of specifications for various kinds of cell groups with which the numbers of composition of a cell differ, the basic circuit can cope with it by changing the number of combination as the same. For this reason, the manufacturing cost of the whole charging equipment can be made cheap by mass-producing that basic circuit.

[0009]According to the invention of claim 2, the terminal voltage monitor means is established between each charging terminal. When the voltage between charging terminals is measured and voltage is not impressed by this terminal voltage monitor means, the voltage impressing from charging equipment is forbidden, and when voltage is impressed, it judges that the terminal of a cell group is connected and shifts to charging operation. From this, since charging operation is not performed when the cell group is not connected to charging equipment, a charging terminal can prevent starting charge, or touching the charging terminal of a voltage impressing state carelessly, and receiving an electric shock of the state where it connected too hastily with the foreign matter.

[0010]

[Embodiment of the Invention]Hereafter, the embodiment of this invention is described based on an accompanying drawing.

The charging equipment of the cell group concerning a 1st embodiment of <1st embodiment> this invention is explained with reference to drawing 1 and drawing 2. This embodiment is related with the charging equipment which charges the cell group of a lithium ion battery. The cell group 1 is stored in the cell case 110, for example, carries out the series connection of the four cells 101-104. The cell case 110 is equipped with the cell side connector 2A, and the cell side connector 2A is provided with the five terminals 21A-25A. The terminal 21A is connected to the anode of the cell 101, and the terminal 25A is connected to the negative electrode of the cell 104. It is connected to the negative electrode of the cell 101, and the anode of the cell 102, and it is connected as the terminal 22A illustrated the terminal 23A and the terminal 24A similarly.

[0011]The charging equipment 3 is equipped with battery-charger side connector 2B in which the cell side connector 2A and combination are possible, and the charging terminals 21B-25B are formed here. Corresponding to said four cells 101-104, it has a total of four cell charge circuits 41-44 (only henceforth the charge circuits 41-44). These charge circuits 41-44 are connected to the commercial power 7 via the main relay switch 5A and the line filter 6, and each charge circuits 41-44 are in the state where multiple connection was carried out to the commercial power 7, respectively. On the other hand in the output side of the charge circuit 41, the anode side output (+) stands in a row in the charging terminal 21B, The negative-electrode side output (-) is connected with the anode side output (+) of the charge circuit 42, and it stands in a row in the charging terminal 22B, and has become a connected state as the output of other charge circuits is illustrated similarly, and the cells 101-104 serve as circuitry to which the voltage of the charge circuits 41-44 is impressed individually after all.

[0012]The switching regulator is used and each charge circuits 41-44 comprise the rectifier 8, the insulated type pressure-lowering chopper 9, and the charge control part 10, as shown in drawing 2, and they are the same structures altogether. For example, if it explains taking the case of the charge circuit 41 which charges the cell 101, it is rectified by the rectifier 8, next after the alternating current power from the inputted commercial power 7 adjusts and lowers the pressure of the duty factor of a switching element by the insulated type pressure-lowering chopper 9, it will be taken out as a dc output. The charge control part 10 controls the insulated type pressure-lowering chopper 9 so that the output voltage and output current of the insulated type pressure-lowering chopper 9 are detected and the cell 101 is carried out as for constant current and constant potential charge. This will change to constant voltage charging control, if it charges by constant current and cell voltage reaches predetermined voltage the early stages of charge.

[0013]Between the anode outputs of the charging terminal 21B and the charge circuit 41, the relay switch 51 is formed in series, and the relay switches 52-54 are similarly formed about the charging terminals 22B-24B. The switching action of the relay switches 51-54 is performed by the relay 50. The output port 13A of the temperature and the voltage monitoring circuit 13 (only henceforth the supervisory circuit 13) which FET12A is connected to the relay 50 in series, and is equivalent to a terminal voltage monitor means performs switching operation of FET12A. The one overvoltage detector 14 each is connected between the outputs of the positive/negative of each charge circuits 41-44, and the output performs switching operation of FET12B. The main relay switch 5A is opened and closed by the relay 5B, and is controlled by the output port 13B of the supervisory circuit 13 by the relay 5B via FET12C.

[0014]The supervisory circuit 13 is provided with CPU and constituted, and the input port 13C establishes the point of measurement in the charging terminal 21B side rather than the relay switch 51, and measures the voltage impressed between the charging terminal 21B and the charging terminal 25B. Since it is judged that the cell side connector 2A is not connected when this voltage is 0 volt, the relay switches 51-54 are considered for the fanout of the output port 13A as as [ opened condition ] as with a low level (L). Since it is judged that the cell side connector 2A is connected when voltage is impressed, the relay switches 51-54 are closed by making fanout of the output port 13A into high level (H). This is to prevent charge voltages from judging the connected state of battery-charger side connector 2B and the cell side connector 2A, and being impressed to battery-charger side connector 2B in the state of connectionless.

[0015]The input port 13D establishes the point of measurement in the output side of the charge

circuit 41 rather than the relay switch 51, and measures the voltage impressed to the charging terminal 21B and the charging terminal 25B. When it will be in the state where the relay switches 51-54 were closed, the voltage of the cell group 1 will be impressed to the input port 13D. Here, the reference voltage level is set up beforehand, the monitoring instrument 13 compares this reference voltage level and the impressed pressure value, and the output port 13B is changed. The reference voltage level is set as the pressure value which is a grade without fear of the inrush current by the cell of overdischarge. When impressed electromotive force is lower than a reference voltage level, the main RIREN switch 5A is made into an opened condition for FET12C as with an OFF state. When impressed electromotive force is higher than a reference voltage level, FET12C is made into an ON state and the main relay switch 5A is closed.

[0016]It is judged whether the input port 13E is in a temperature requirement predetermined in the temperature value which was connected to the temperature survey circuit 15 provided near the charging terminal 21B, and was measured. When it is in a predetermined temperature requirement, the output state of the output ports 13A and 13B is not reversed, but when there is nothing to a predetermined temperature requirement, the output ports 13A and 13B are made into a low level (L), and it changes into the state which cannot be charged.

[0017]Now, operation of the above-mentioned composition is explained. For example, since voltage is not impressed to the input port 13C in the state where the charging equipment 3 was beforehand connected to the commercial power 7 when the cell side connector 2A is not connected to battery-charger side connector 2B, Since FET12A is an OFF state, it is not energized for the relay 50, but the relay switches 51-54 have been opened wide. Here, since the voltage of the cell group 1 will be impressed to the input port 13C if the cell side connector 2A is connected to battery-charger side connector 2B, FET12A will be in an ON state, the relay 50 is magnetized, and the relay switches 51-54 are closed.

[0018]If the relay switches 51-54 are closed, the voltage of the cell group 1 will be impressed to the input port 13D. When this voltage is below a reference voltage level, the main relay switch 5A is left an opened condition by setting FET12C to OFF, and an electric power supply is not performed to the charge circuits 41-44. When it is beyond a reference voltage level, it charges by turning ON FET12C and closing the main relay switch 5A. When the temperature value inputted into the input port 13E is in the temperature requirement set up beforehand, and charge is continued and it becomes the outside of the temperature requirement since a charging characteristic changes with temperature, the cells 101-104 open the main relay switch 5A wide, and stop charge.

[0019]As for the cells 101-104, constant current and constant voltage charging control are individually performed by each charge circuits 41-44, respectively. If charge advances, dispersion in capacity or the charging capacity by the difference in internal impedance will arise with each cells 101-104. Therefore, the cells 101-104 are changed from what became predetermined voltage to constant voltage charging control from constant-current-charge control one by one. The charging current which flows into a cell gradually decreases, and since it is constant voltage control, if it serves as a full charge, when charging current will not flow, it will be completed as charge is natural, as a full charge is approached. For example, though the cell 101 will serve as a full charge and charging current will not flow into the beginning, If other cells 102-104 do not serve as a full charge, the charge by the charge circuits 42-44 is continued to them, Next, for example, if the cell 103 serves as a full charge, charge will be continued only for the remaining cell 102 and the cell 104, and all the cells 101-104 will serve as a full charge eventually.

[0020]For example, if the cell 103 serves as excess voltage during charge by the control error of the charge control part 10 of the charge circuit 43, the output signal of the overvoltage detector 14 which detected excess voltage will be reversed to high level (H). Then, FET12A is set to OFF, the relay switches 51-54 are wide opened with powering off of the relay 50, and charge of all the single ** 101-104 is interrupted. Since the surveillance of double charge voltages will be performed by this overvoltage detector 14, the danger of becoming excess voltage and degrading the cell group 1 whole is reduced more.

[0021]Thus, according to this embodiment, the cells 101-104 are equipped with the one-piece each charge circuits 41-44, and each charge circuits 41-44 are in the state by which multiple

connection was carried out to the commercial power 7 which is a power supply source, respectively, and charge the cells 101-104 individually by each charge circuits 41-44. Since control of charge voltages is made by the charge control part 10 with which each charge circuits 41-44 were equipped, the protection circuit by the side of the cell group 1 is omissible. The small size and the weight saving of a cell group are possible, and especially when it is attached to the electronic equipment side and carries, it is more convenient than this. The futility that it must throw away to the protection circuit which can be used from requiring only exchange of a cell group at the time of cell group exchange can be excluded.

[0022]The input port 13C is supervising the impressed electromotive force between charging terminal 21B and the charging terminal 25B, and when the voltage impressed to the input port 13C is 0 volt, he is trying to close the relay switches 51-54 by making the output port 13A into a low level (L). It will mean that battery-charger side connector 2B and the cell side connector 2A are not connected in the impressed electromotive force of 0 volt, and charge voltages will be impressed in this case. this -- battery-charger side connector 2B -- a foreign matter -- charge can be started in the state where it connected too hastily, or some human bodies can contact the charging terminals 21B-25B, and it can prevent receiving an electric shock with impressed electromotive force. Since the voltage of the cell group 1 connected in the input port 13D is measured, and the main relay switch 5A will be made into an opened condition if it is below reference voltage, a high current can be prevented from flowing temporarily when the voltage of the cell group 1 is above low.

[0023]A 2nd embodiment of <2nd embodiment> this invention is described with reference to drawing 3. This embodiment is what made the number of the cells of a 1st embodiment seven pieces, and the explanation which gives identical codes to the same portion and overlaps is omitted. That is, it is what was provided with the seven charge circuits 41-47, the overvoltage detector 14, and the relay switches 51-57 corresponding to the seven cells 101-107, and each cells 101-107 can be charged independently, respectively. Thus, if it has a charge circuit, an overvoltage detector, and a relay switch according to the number of cells, it can be made to function as charging equipment which does not need a protection circuit.

[0024]Thus, each charge circuits 41-47 and the overvoltage detector 14 which are component parts of the charging equipment 3 of said 1st embodiment and this embodiment can be made into common circuitry for every cell. Therefore, in the case where the charging equipment corresponding to each is manufactured to various kinds of cell groups with which the numbers of composition of a cell differ, Since it can respond by changing the number of the combination of these aforementioned component parts, the manufacturing cost as the whole charging equipment can be made cheap by mass-producing said component parts.

[0025]<Other embodiment> this invention is not limited to the embodiment described with the above-mentioned description and a drawing, and further, within limits which do not deviate from a gist besides the following, it can be contained in the technical scope of this invention, and the following embodiments can also be changed variously, and can carry it out, for example.

(1) Although this embodiment showed the case where a cell cell was a lithium ion battery, they may be various kinds of storage batteries, such as not only this but a lead storage battery, and a nickel cadmium rechargeable battery.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]However, with the above-mentioned composition, in order to supervise charge voltages for every cell, the voltage detector had to be established in each cell, respectively, and there was a problem that the protection circuit united with a cell group became complicated. In providing a balancer circuit in addition to the voltage detector for every cell, it complicates a protection circuit further. Since it is unified in the battery pack, such a protection circuit becomes the hindrance of the weight saving of a battery pack, or a miniaturization, and since it is discarded with a cell group at the time of a changing battery, it becomes useless.
[0004]In light of the above-mentioned circumstances, this invention is that the purpose provides the charging equipment of the cell group which can simplify the protection circuit united with a cell group as much as possible.

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## MEANS

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[Means for Solving the Problem]An invention of claim 1 is the charging equipment of a cell group for charging a cell group which carries out the series connection of two or more cells, It has two or more pairs of charging terminals connected to each terminal which stands in a row in an anode and a negative electrode of said cell, Having a charge control part which detects voltage between charging terminals which make a cell charge circuit which charges said each cell, and said pair between charging terminals which make these pairs, and controls charging operation of said cell charge circuit, respectively, said each cell charge circuit has the feature at a place by which multiple connection is carried out to a common power supply.
[0006]An invention of claim 2 establishes a terminal voltage monitor means which supervises voltage between each charging terminal which stands in a row in said cell in the thing according to claim 1, It has the feature at a place to which charging operation of said cell charge circuit is made to perform on condition that voltage is impressed between said charging terminals by this terminal voltage monitor means.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1]The circuit diagram of the charging equipment concerning a 1st embodiment of this invention
[Drawing 2]The circuit diagram of the cell charge circuit concerning a 1st embodiment
[Drawing 3]The circuit diagram of the charging equipment concerning a 2nd embodiment
[Description of Notations]
1 -- Cell group
2A -- The cell side connector
2B -- The battery-charger side connector
41-44 -- Cell charge circuit
10 -- Charge control part
13 -- Temperature and voltage monitoring circuit

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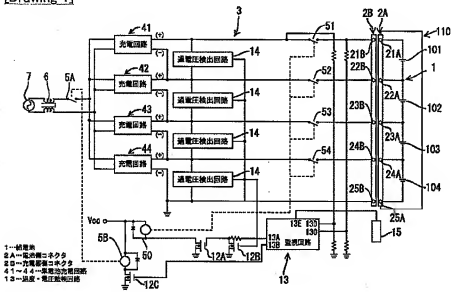
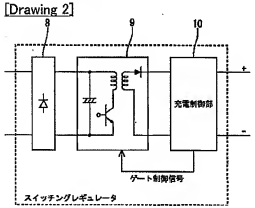
## DRAWINGS

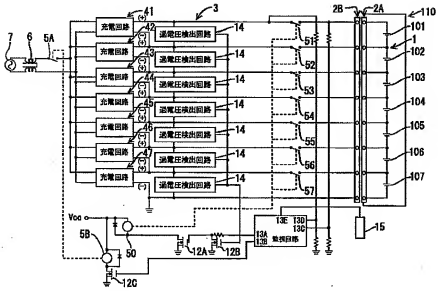
[Drawing 1]




[Drawing 2]




[Drawing 3]

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